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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/721,578	11/21/2000	Terje A. Skotheim	MT-0026.2	2463

7590 07/29/2003

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EXAMINER

CANTELMO, GREGG

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 07/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/721,578

Applicant(s)

SKOTHEIM ET AL.

Examiner

Gregg Cantelmo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. In response to the amendment received June 2, 2003:
 - a. The prior art rejections to Kawakami stand;
 - b. The obviousness-type double patenting rejections stand.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1-15 now recite that the single ion conducting layer is a non-electrically conductive layer. This limitation appears to be contradictory to itself. More clearly, the layer conducts ions and therefore in fact is electrically conducting. It may be that Applicant intended to mean that the layer is non-electronically conducting, however as the claim stands, the current terminology is not clear and lacks enablement since it is unclear how an ion conducting layer is non-electrically conductive when ion conducting materials known in the art are all understood to be electrically conducting.

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4. Claims 1-15 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1-15 recite that the single ion conducting layer is non-electrically conductive. However the specification fails to teach such a relationship and further fails to describe how an ion conducting layer is non-electrically conductive when ion conducting materials known in the art are all understood to be electrically conducting.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 14 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 5,824,434 (Kawakami).

Kawakami discloses an anode of an electrochemical cell, wherein said anode comprises: a first anode active layer comprising lithium metal (col. 2, ll. 58-60) and a multi-layer structure in contact with a surface of the first anode active layer, wherein said multi-layer structure comprises 3 or more layers (col. 3,

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ll. 19-23), wherein at least one of said three or more layers comprises a single ion conducting layer and at least one of said three or more layers comprises a polymer layer (col. 28, ll. 5-11). The stacked structure recited in col. 28, ll. 1-11 includes a conductor layer, semiconductor layer and insulating layer stacked by a vapor deposition method. Thus this constitutes a 3-layered structure. Each of these layers conducts lithium ions and is single ion conductors. The insulating layer is a polymer material (col. 27, ll. 5-10 as applied to claim 14).

The structure can be four layers (col. 3, ll. 19-23 as applied to claim 15).

Response to Arguments

7. Applicant's arguments filed June 2, 2003 have been fully considered but they are not persuasive.

Applicant argues that Kawakami does not teach or suggest of a non-electrically conductive single ion conducting layer.

This argument is not persuasive since the limitation is not understood (see 112 rejections above).

In so much as the term "electrically conductive" is meant to mean "electronically conductive" it is held that the prior art still teaches this operation.

The ion permeable layer 005 (Fig. 9C) is an insulative layer and thus while it conducts ions, it does not conduct electrons and thus is a non-electrically conductive single ion conducting layer (and col. 24, ll. 26-30).

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Thus while some of the layers may be electronically conductive as argued by applicant, Kawakami does teach of the ion conducting layer being non-electronically conductive since it is an insulative material.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1, 3, 4, 5, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of U.S. patent No. 5,529,860 (Skotheim).

Kawakami discloses an electrochemical cell comprising: a cathode or positive pole (col. 18, ll. 28-30), an anode or negative pole (col. 7, ll. 24-29) a non-aqueous electrolyte interposed between the cathode and anode (col. 16, ll. 58-60 and Fig. 8) wherein said anode comprises: a first anode active layer comprising lithium metal (col. 2, ll. 58-60) and a multi-layer structure in contact with a surface of the first anode active layer, wherein said multi-layer structure comprises 3 or more layers (col. 3, ll. 19-23), wherein at least one of said three or more layers comprises a single ion conducting layer and at least one of said three or more layers comprises a polymer layer (col. 28, ll. 5-11). The stacked structure recited in col. 28, ll. 1-11 includes a conductor layer, semiconductor layer and insulating layer stacked by a vapor deposition method. Thus this constitutes a 3-layered structure. Each of these layers conducts lithium ions and

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is single ion conductors. The insulating layer is a polymer material (col. 27, ll. 5-10 as applied to claim 1).

The thickness of the structure can vary depending on the make-up of the structure and can be 10 microns or less such as 1 micron (col. 28, ll. 12-23 as applied to claims 3 and 4).

The structure can be four layers (col. 3, ll. 19-23 as applied to claim 5).

The organic solvent of the electrolyte provides for a liquid electrolyte (col. 16, ll. 58-60 as applied to claim 10).

The anode comprises a current collector substrate 100 in contact with a first surface of the anode active layer on the side opposite to the multi-layered structure (Fig. 1 as applied to claim 12).

The difference between instant claim 1 and Kawakami is that Kawakami does not teach or suggest the cathode having an electroactive sulfur-containing compound therein.

Skotheim discloses of cathodes having electroactive sulfur (abstract).

The motivation for using a cathode having an electroactive sulfur-containing compound therein is that it improves the storage capacity of the electrochemical cell at ambient and sub-ambient temperatures (col. 1, ll. 10-16).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by using a cathode having an electroactive sulfur-containing compound therein since it would have improved the storage capacity of the electrochemical cell at ambient and sub-ambient temperatures.

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10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No. 5,569,520 (Bates).

The difference not yet discussed is of the thickness of the anode active layer (claim 2).

Kawakami is drawn to forming thin film batteries (col. 3, ll. 46-55). Bates is further drawn to forming thin film batteries wherein the anode active film is 9 microns thick (col. 5, ll. 7-17 and col. 2, ll. 20-25).

Selection of an anode foil of a thickness from 2-100 microns is known in the art as taught by Bates. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesche, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

The motivation for selecting an anode thickness from 2-100 microns is that it would have provided an optimal active layer thickness with reduced electrical resistance.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by optimizing the anode active film thickness to be 2 to 100 microns as shown by Bates since it would have provided an optimal active layer thickness with reduced electrical resistance.

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Response to Arguments

11. Applicant provides no additional arguments to the 103 rejections of Kawakami in view of Skotheim or Kawakami in view of Skotheim in view of Bates as set forth above, apart from the arguments drawn to Kawakami as discussed in item 7 above, incorporated herein.

Claim Rejections - 35 USC § 103

12. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No. 5,314,765 (Bates '765).

The difference not yet discussed is of the protective layers comprising LiPON (claims 7 and 8).

Bates '765 teaches that single ion conducting layers (such as LiPON) can be used in a lithium battery as a protective or barrier layer on the anode active layer (abstract).

The motivation for using LiPON as an ion conducting layer in a protective barrier arrangement disposed on the anode active layer is that it separates the lithium anode and the electrolyte. Further, by coating the lithium anode with this material lay-up, the life of the battery is lengthened and the performance of the battery is enhanced (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Bates '765 by providing a LiPON protective layer as taught by Bates '765 since it would have

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separated the lithium anode and the electrolyte, lengthened the life of the battery and enhanced the performance of the battery.

Response to Arguments

13. Applicant's arguments filed June 2, 2003 have been fully considered but they are not persuasive.

Applicant argues that the combination of prior art of record as applied to claims 7 and 8 would impermissibly change the operation of Kawakami.

The Examiner respectfully disagrees.

Kawakami teaches that the ion conducting polymer layer is a glass material (paragraph bridging columns 7 and 8). In the example disclosed in column 24, the ion conducting layer 005 is an insulative layer and thus is ionically conductive but not electronically conductive. Thus replacement of the ion-permeable membrane with other ion-permeable membranes would have been obvious to one of ordinary skill in the art.

Thus the modification of Kawakami in view of Bates as set forth above, with respect to the ion conducting but non-electron conducting (insulating) membrane would have been obvious since it would have permitted ion conducting, while being electrically insulating and additionally separated the lithium anode and the electrolyte. Further, by coating the lithium anode with this material lay-up, the life of the battery is lengthened and the performance of the battery is enhanced (abstract).

Claim Rejections - 35 USC § 103

14. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No. 6,277,514 (Ying).

The difference not yet discussed is of the polymer layer comprising one or more acrylate monomers selected from the group consisting of alkyl acrylates, glycol acrylates and polyglycol acrylates.

Kawakami polymerizes various polymer materials as part of the protective layering atop the anode active material (col. 8, ll. 39-45). Ying discloses that it is known to employ various acrylates in a protective coating for anodes (col. 13 ll. 3-10 and prior art claim 8). The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

The motivation for using acrylates such as alkyl acrylates, glycol acrylates and polyglycol acrylates is that it provides a polymer layer having barrier properties with improved lithium ion conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by using acrylates such as alkyl acrylates, glycol acrylates and polyglycol acrylates since it would have provided a polymer layer having barrier properties with improved lithium ion conductivity. The selection of a known material based on its

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suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

Response to Arguments

15. Applicant provides no additional arguments to the 103 rejections of Kawakami in view of Skotheim in view of Ying as set forth above, apart from the arguments drawn to Kawakami as discussed in item 7 above, incorporated herein.

Claim Rejections - 35 USC § 103

16. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakami in view of Skotheim as applied to claims 1, 3, 4, 10 and 12 above, and further in view of U.S. patent No.5,387,479 (Koksbang).

The difference not yet discussed is the particulars of the substrate.

Kawakami discloses that the collector, i.e. substrate, is made of fiber, porous or mesh-like carbon, stainless steel, titanium, nickel, copper, platinum or gold (col. 21, ll. 29-31).

Koksbang teaches that it is known to configure metal current collectors as foils (col. 2, ll. 31-35).

The motivation for using a foil substrate for the current collector is that it reduces the weight of the battery.

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Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Kawakami by using a metal foil substrate for the current collector since it would have reduced the weight of the battery.

Response to Arguments

17. Applicant provides no additional arguments to the 103 rejections of Kawakami in view of Skotheim in view of Koksbang as set forth above, apart from the arguments drawn to Kawakami as discussed in item 7 above, incorporated herein.

For the record item 7 on page 9 of Applicant's response should be to claim 13 and the inventor's name therein Koksbang.

Double Patenting

18. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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19. Claims 1, 2, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 9, 11, 37, 38, 43, 45-50 and 57 of copending Application No. 09/721,519 (USAPP '519). Although the conflicting claims are not identical, they are not patentably distinct from each other.

USAPP '519 claims a cathode comprising a cathode active material which comprises an electroactive-sulfur containing material (claims 37 and 57); an anode (claim 37); a non-aqueous electrolyte interposed between said anode and cathode (claim 37); wherein said anode comprises an anode active layer, which the anode active layer comprises: a first layer comprising lithium metal (claim 37); an a multilayer structure comprising: an ion conducting layer comprising a glass selected from the group specified in claim 47 identical to the group in instant claim 7 (claims 46 and 47) a polymer layer (claims 48-50 as applied to claim 1) and a temporary protective metal (claim 37 as applied to claim 1).

The thickness of the first anode active layer is 2 to 100 microns (claim 41 as applied to claim 2).

The multilayer structure as claimed above comprises a first layer of lithium and three additional layers of a metal, ion conducting layer and polymer layer. Thus the structure comprises four or more layers (as applied to claim 5).

The temporary protective metal layer includes Zn, Mg, Sn and Al (claim 38 as applied to claim 6).

The ion conducting layer genus is identical to the instant claims (claims 46 and 47 as applied to claims 7 and 8).

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The non-aqueous electrolyte is a liquid electrolyte (claim 54 as applied to claim 10).

The metal layer is a temporary protective metal which is in contact with the first layer comprising lithium and therefore is an intermediate layer between the first layer and the additional ion conducting and polymer layers (claims 37 and 46-50 as applied to claim 11).

The anode further comprises a substrate in contact with a surface of said first anode active layer on the side opposite to the additional layers (claim 43 as applied to claim 12).

The substrate is selected from the same genus in both the instant claims and claims of USAPP '519 (claim 45 as applied to instant claim 13)

USAPP '519 claims an anode of an electrochemical cell comprising a first anode active layer of lithium (claim 1) and three additional layers of a metal (claim 1), ion-conducting layer (claim 9) and polymer layer (claim 11 as applied to claim 14). Thus the structure comprises three or more layers and further four or more layers (as applied to claims 14 and 15).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

20. Claims 14 and 15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 6 of copending Application No. 09/864,890 (USAPP '890). Although the conflicting claims are not identical, they are not patentably distinct from each other.

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USAPP '890 claims a method of making an anode. The method resulting in a product which obviates the instant claimed invention. More clearly:

The process of claim 1 of USAPP '890 forms an anode for an electrochemical cell comprising: a first anode active layer comprising lithium metal, a polymer layer and a single ion conducting layer. Thus generating an anode comprising three or more layers (claim 1 as applied to claim 14).

An additional metal layer is interposed in the multilayer structure thereby providing a fourth layer (claim 6 as applied to claim 15).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

21. Applicant has not rebutted the double patenting rejections nor has Applicant submitted terminal disclaimers in response to these rejections. Therefore these rejections stand.

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is

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filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-2383. FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo
Patent Examiner
Art Unit 1745

gc



Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700

July 26, 2003